

REMARKS

The Office Action of May 24, 2005 has been received and its contents carefully considered.

Revisions to the Application

The present Amendment corrects informalities in the specification that were noted during review of the application, and edits the Abstract to improve its general readability.

The present Amendment also cancels claims that have been withdrawn from consideration in the present application. In addition, the Amendment revises the independent claims that remain in the application (that is, claims 1, 2, and 20) and adds new claims 33-40 to further protect the invention. Of these new claims, claim 37 is independent and the rest are dependent.

The Rejections

The Office Action rejects independent claims 1, 2, and 20 (along with various dependent claims) for anticipation by U.S. patent 6,552,266 to Carden et al. This reference will hereafter be called simply "Carden." The Office Action also rejects independent claims 1, 2, and 20 (along with two dependent claims) for anticipation by U.S. patent 5,866,943 to Mertol. In addition, the Office Action rejects independent claim 1 (together with three dependent claims) for anticipation by U.S. patent 6,504,096 to Okubora. For the reasons discussed below, however, it is respectfully submitted that all of the independent claims now pending in this application are patentable over Carden, Mertol, and Okubora.

The Carden Reference

Independent claim 1 recites a substrate having a first area where a semiconductor device is mounted. The substrate also has a second area that surrounds the first area. The semiconductor itself has first and second surfaces. A plurality of terminals are provided on the first surface of the semiconductor device, which is mounted on the substrate in such a manner that its first surface is opposite to the surface of the substrate. Claim 1 has a second “wherein” clause which recites that “a first heat radiating film is disposed on the second area of the substrate, and a second heat radiating film is disposed on the second surface of the semiconductor device but does not extend beyond the periphery of the second surface, with the second heat radiating film being spaced apart from the first heat radiating film.”

In contrast to what is recited in claim 1, Figure 2B of the Carden reference (the same figure that is reproduced on the cover page of the patent) shows a chip having a circuitry portion 42. A body of interface materials 74 (such as “low melt solder paste, an adhesive such as ..., and thermal grease, e.g., zinc oxide based material”; column 4, lines 27-31) on the top surface of the chip. Above that lies a cover plate 20. Both Carden’s body of interface materials 74 and his cover plate 20 extend beyond the periphery of the second surface of Carden’s chip.

Accordingly, it is respectfully submitted that the invention now defined by claim 1 is not anticipated by Carden. Nor would an ordinarily skilled person who wanted to improve Carden’s device in some way have had a motive to modify Carden’s cover plate 20 (or his body of interface materials 74, either, for that matter) so as to achieve the invention that is now defined by claim 1.

The second “wherein” clause of independent claim 2 now recites that “a heat radiating film is disposed on the second surface of the semiconductor device without extending beyond the periphery of the second surface, and exposes the side surfaces of the semiconductor device.” As was noted above during the discussion of claim 1, Carden’s cover plate 20 extends past the periphery of the top surface of his chip.

Turning next to independent claim 20, the second “wherein” clause of this claim now recites that “a thermal emission film for radiating heat is disposed on the second surface of the semiconductor device without extending beyond the periphery of the second surface.” For the reasons discussed above with respect to claim 1, it is respectfully submitted that this is neither disclosed nor suggested by Carden.

New independent claim 37 recites “a heat radiating film disposed on the second surface of the semiconductor device without extending beyond the periphery of the second surface and without overlapping the first heat radiating film, the second heat radiating film having a peripheral edge that is exposed to air.” Carden’s cover plate 20 clearly neither discloses nor suggests the “second heat radiating film” of claim 37.

The Mertol Reference

Mertol’s Figure 3 (the same figure that is reproduced on the cover page of the patent) merely shows a heat spreader 26 above a chip 10, with a thermal interface layer 40 between them.

As was noted previously, the second “wherein” clause of claim 1 provides that “a second heat radiating film is disposed on the second surface of the semiconductor device but does not extend beyond the periphery of the second surface ...”. Independent claims 2, 20, and 37 have similar limitations. Such a “second heat radiating film” is

neither disclosed nor suggested by Mertol's heat spreader 26. Moreover, it should be noted that Mertol's thermal interface layer 40 cannot accurately be characterized as a "heat radiating film" since its function is to transfer heat, not radiate it.

The Okubora Reference

The Okubora reference merely discloses connectors 20 formed on a substrate 2, a metal plate 16 disposed above a chip 10, and a conductive bonding layer 14 between the upper surface of the chip 10 and the metal plate 16.

Near the bottom of page 7, the Office Action characterizes Okubora's connectors 20 as the "first heat radiating film" of claim 1. Such an interpretation is not consistent with claim 1, since the second "wherein" clause of the claim provides that the second heat radiating film of the claim is "spaced apart from the first heat radiating film." Okubora's connectors 20 are clearly not "spaced apart" from his metal plate 16.

In addition, Okubora's metal plate 16 extends beyond the periphery of the second surface of Okubora's chip 10. This represents an additional reason why Okubora neither discloses nor suggests the invention defined by claim 1.

The Office Action does not reject independent claims 2 and 20 on the basis of Okubora, but it is nevertheless appropriate to consider new independent claim 37. It is respectfully submitted that claim 37 is patentable over the reference for at least the reason that claim 27 recites "a second heat radiating film disposed on the second surface of the semiconductor device without extending beyond the periphery of the second surface and without overlapping the first heat radiating film ...".

Since the remaining claims depend from the independent claims discussed above and recite additional limitations to further define the invention, they are patentable along with their independent claims and need not be further discussed.

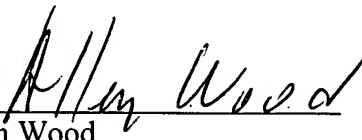
Conclusion

It is noted that the present Amendment adds 7 new claims to the application, with one of them being independent. However, the Amendment also cancels 12 claims, with three of them being independent, so an additional claim fee is not due. Nevertheless, the Director is hereby authorized to charge any fees that may be needed to our Deposit Account number 18-0002.

It is also noted that an Information disclosure Statement is being filed concurrently.

For the reasons discussed above, it is respectfully submitted that this application is in condition for allowance. Reconsideration of the application is therefore respectfully requested.

Respectfully submitted,



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